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## The correct name for the hemlock spruce\*

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A casual perusal of the local floras covering eastern North America shows that the white spruce passes under the name of *Picea canadensis* (Mill.) BSP. and the hemlock spruce, of *Tsuga canadensis* (L.) Carr. Now, although Britton, Stearns, and Poggenberg quote Miller as the original author of the specific name *canadensis* of the white spruce, it becomes very evident through a perusal of Miller's description that his specific name is derived from the Linnaean *Pinus canadensis* and, therefore, that the proper citation (under article 41 of the Vienna rules) should include the name of Linnaeus, in parentheses, as the original author, instead of that of Miller. Here is, then, the anomalous position of two distinct species bearing the same specific name and both being derived from the same author, publication, and description, a condition contrary to all laws of botanical nomenclature, which provide that the specific name can be maintained for only one element of an aggregate when that aggregate is segregated. It remains, therefore, to determine which one of these two species shall retain the specific name *canadensis*. The first step is to determine if possible, what the Linnaean type of *Pinus canadensis* may be; if that can be determined, the rest will be easy, for the type element of an aggregate will retain the specific name upon segregation.

The description of *Pinus canadensis* in the 2d edition of the Species Plantarum, 1763, on page 1421, is as follows:—

10. PINUS foliis solitariis linearibus obtusiusculis *canadensis* submembranaceis.

Abies foliis solitariis confertis obtusis membranaceis. *Gron. virg.* 191.\*

Abies foliis piceae brevioribus, conis parvis biuncialibus laxis. *Mill. dict. t. 1.*

*Habitat in America septentrionali. 2.*

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\* Contributions to the Botany of Michigan, No. 10. Read at the St. Louis meeting of the Botanists of the Central States, October 17, 1914.

As there is no specific mention of a type we may arrive at one by considering (1) the herbarium specimens, (2) the description, (3) the synonyms, and (4) the specific name and habitat. *Pinus canadensis* is represented in the Linnaean Herbarium, but Mr. B. D. Jackson, in his Index to the Linnaean Herbarium, shows that the specimen was not received until later than 1767, several years after the publication of the species, and that it is not authenticated by Linnaeus; it may therefore be disregarded as not bearing upon the point in question.

The descriptive phrase of Linnaeus is not distinctive and can not limit his species to any one form; he took no consideration of the cones whatever; he described the leaves as solitary, linear, somewhat obtuse, and submembranaceous, characters that apply to the leaves of a number of species of the solitary-leaved Abietaceae and therefore can not be considered as specific in character. The first synonym cited is that of Gronovius. Gronovius' species was published as follows on page 191 of the 1st edition of the *Flora Virginica*, part 2, 1743:

*ABIES foliis solitariis confertis obtusus membranaceis.*

*Abies minor pectinatis foliis Virginiana conis parvis, subrotundis. Plukn. Alm. p. 2 t. 121 Fig. 1*

*Abies minor Taxifoliis, conis parvis subrotundis, deorsum spectantibus. Clayton N. 547*

*Folia linearis, plana, tenuissima, carinata, obtusa, confertim natam solitaria. Coni magnitudine fragae, ovati, acuminati, squamis numerosis planis subrotundis obtusissimis.*

In this connection it may properly be remarked that the plant of Plukenet, which is presumably the type of his figure 1, plate 121, is preserved in the Herb. Sloane, volume 95, folio 1, and is the hemlock spruce, generally known as *Tsuga canadensis* Carr.; also that the plant of Clayton, No. 547, upon which Gronovius based his species, is preserved at the British Museum and is the same thing.

Here we have not only a very accurate description of the leaves and cones but herbarium specimens and a published figure to supplement the descriptions, all of which, taken together, accurately limit the species defined to the hemlock spruce commonly known as *Tsuga canadensis* Carr. Apparently this should be

definite enough to fix the status of *Pinus canadensis* L. But let us go a little deeper into the question before taking up the next synonym. *If we take the first synonym enumerated under a species as the type of that species, in case no type is specifically named*, then *Pinus canadensis* L. becomes a pure synonym of *Pinus balsamea* L., for the first synonym cited under both species is the same Gronovian species, which is the hemlock spruce! Let us, therefore, investigate the *Pinus balsamea* of Linnaeus, published on page 1002 of the 1st edition of the Species Plantarum in 1753, as follows:

*Balsamea.* 9. PINUS foliis solitariis subemarginatis: subtus linea duplici punctata.

*Abies foliis solitariis confertis obtusis membranaeis. Gron. virg. 191.\**

*Abies minor, pectinatis foliis, virginiana, conis parvis subrotundis. Pluk. alm. 2. t. 121. f. 1. Raj. dendr. 8.*

*Habitat in Virginia, Canada. 2*

*Habitus antecedentis [Pinus Picea], sed Folia latiora, obtusiora, utrinque per ramos pectinatim digesta, at duplici serie, superiore sc. breviora, subtus sunt picta linea duplici glauca: singula ex 8 ordinibus longitudinalibus punctorum alborum. Apex foliorum saepe bifidus.*

A careful inspection of the above shows that it is an aggregate and composed of such divergent species as the balsam firs with *erect* cones and the hemlock spruce with *hanging* cones. To which element, then, under the rules of botanical nomenclature, does the name *Pinus balsamea* L. belong? There is unfortunately no rule covering this point in the Vienna rules nor, so far as the writer is aware, in any other code. There are no generic descriptions in the Species Plantarum and while there are specific diagnoses, these, from the modern point of view, are drawn so loosely in many cases that they are of little diagnostic value. Furthermore, the Species Plantarum is not considered to be a descriptive work but a mere application of the binomial system to the then known species—those that already had been published under the polynomial system by various older authors—and the species therein

enumerated are considered to be based upon citations rather than upon the descriptive phrases. Should then the most emphasis be placed upon the description or upon the citations? This is an important principle upon which no agreement has been reached; it ought to be definitely settled by a botanical congress, since very often, as in the present instance, widely different results may be obtained by different authors following out the different methods of treatment. Some authors prefer to adopt the descriptive matter as their guide, others the synonyms cited; so that we have such expressions as *Sonchus alpinus* L., as to character; or, as to the synonymy; or, as to the habitat, as the case may be. In the present instance, and it might be said in all instances of the kind, the best way is to let the internal evidence decide, adopting the name for that element which receives the preponderant weight of evidence. *If citations are considered to carry the greatest weight, for the Species Plantarum is par excellence the work in which the binomial system is applied to citations, then the name Pinus balsamea* L. *belongs to the hemlock spruce, for all the citations under that name are of this species.* The Linnaean herbarium contains no specimen which can be designated as the type, since it contained no specimen of the species at the time of its publication. Let us now look at the descriptive matter—the diagnostic phrase and the note under *Habitus*. There is absolutely nothing in the descriptive matter that will limit it to any one species; the cones are not at all considered; the characters ascribed to the leaves are applicable to other species than the balsam fir; in other words they are of a group or groups of a higher order than that of a species, i. e., an aggregate. The same may be said of the habitat given, which is Virginia and Canada; the specific name is *balsamea*, and this alone is indicative of what Linnaeus may have had in view as the type of his species. As a matter of fact, the *Pinus balsamea* of Linnaeus is so broadly drawn that it may be appropriately considered a huge pit into which *all* the *spruces* and *firs* of eastern North America may be conveniently dropped to form a conglomerate whole. Notwithstanding the fact that the Species Plantarum is primarily a publication founded upon the work of earlier botanists and that the binomials therein are mostly based upon and applied to the citations enumerated from those earlier

botanists, we may be justified, in the present instance, in following precedent and in disregarding the synonyms cited and the description also, allowing the name to represent the balsam fir; for this is undoubtedly the interpretation Linnaeus intended it to have as is indicated by the specific name.

Having excluded the hemlock synonyms from consideration under *Pinus balsamea* and having settled the status of that species we may resume consideration of *Pinus canadensis*. We have already shown that the first citation refers definitely to the hemlock spruce. We will now consider the Millerian synonym and endeavor to determine its status. This carries us back to the 7th edition of the "Gardeners Dictionary" published in 1759 and the "Figures" published in 1760. In the former work, Philip Miller has segregated the Linnaean aggregate and described four species from America under *Abies* as follows:

3. *ABIES minor, pectinatis foliis, Virginiana, conis parvis subrotundis. Pluk. Alm.* The Virginian Fir Tree, with small roundish Cones, *commonly called* Hemlock Fir.
4. *ABIES piceae foliis brevibus, conis minimus. Rand.* The Pitch-leaved Fir Tree, with small Cones, *commonly called* The Newfoundland Black Spruce Fir.
5. *ABIES piceae foliis brevioribus, conis parvis biuncialibus laxis. Rand.* The shortest Pitch-leaved Fir Tree with loose Cones, *commonly called* The Newfoundland White Spruce Fir.
6. *ABIES taxi foliis, odora, Balsami Gileadensis, Raii Hist. App.* The Balm of Gilead Fir.

Here we have, so far as the writer is aware, the first post-Linnaean description of the species as they are understood at the present time. Unfortunately, Miller had not at that time accepted the binomial nomenclature of Linnaeus and consequently his species received no specific appellations; his work, however, can not be ignored any more than can the *Species Plantarum* itself. The descriptions and the notes on the following page as to the native habitats, habits, etc., and the culture of the various plants in England leave no doubt whatever as to the identity of the species. No. 5 was illustrated in the following year, 1760, in the "Figures," and this is the species cited by Linnaeus under

his *Pinus canadensis*. I have not seen the plate published by Miller but, considering the fact that he had a very clear conception of the various species and access to living material of all, I doubt not but that it is characteristic of the white spruce.\* We have no choice but to consider the 7th edition of the Gardeners Dictionary to be the publication in which the delimitation or segregation of our spruces and firs began and to be guided accordingly. It has become very clear from the foregoing that the *Pinus canadensis* of Linnaeus is an aggregate consisting of the hemlock spruce and the white spruce. The habitat gives us no clue as to which may be considered the type but the specific name, as in the case of *Pinus balsamea*, may. The white spruce is most characteristically a Canadian species, while the hemlock spruce is characteristically American, using the latter term as equivalent to the United States; hence the specific name indicates the white spruce. Also what more than likely that Linnaeus in establishing his *Pinus canadensis* was guided more by the *recently published but specifically unnamed* plate of Miller, than by the old description of Gronovius? We must also consider the fact that the *Plukenetian species, also illustrated and the true hemlock spruce, was left under Pinus balsamea*. The very fact that the hemlock spruce was divided between the two species is paramount in itself to proof positive that the author did not consider it the type of either. A careful weighing and consideration of the above problems leads to the conclusion that the Millerian synonym, *not the Gronovian*, is the type of *Pinus canadensis* L.

To sum up: *Pinus balsamea* L. of the 1st edition of the Species Plantarum is an aggregate which may be considered to include *all* of the firs, spruces, and hemlocks.

Miller, in 1759, segregated the Linnaean aggregate, recognizing four species, but did not name them under the binomial system.

Linnaeus, in 1763, recognized, in part, the work of Miller and established *Pinus canadensis*, on, we shall claim, the Millerian species (No. 5) but probably intended it to contain all species with *drooping* cones. Unfortunately he neglected to remove the

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\* Since writing the above I have received a communication from Mr. A. Gepp, of the British Museum, in which he informs me that the plate of Miller referred to is considered by Mr. A. Bruce Jackson, an authority on the Coniferae, to be the *Picea canadensis* BSP., thus confirming the deductions above drawn.

Plukenetian synonym from *Pinus balsamea* which, very likely, was intended to include all species with *erect* cones. Five years afterward, 1768, Miller published the 8th edition of the Gardeners Dictionary and in this work he not only recognized the four species of the 7th edition, but the binomial system also and consequently gave specific appellations to the species.

The balm of Gilead fir or balsam fir (species No. 6 of the 7th edition) becomes *Abies balsamea*, species No. 3.

The white spruce fir (species No. 5 of the 7th edition) becomes *Abies canadensis*, species No. 4.

The black spruce fir (species No. 4 of the 7th edition) becomes *Abies mariana*, species No. 5.

The hemlock fir (species No. 3 of the 7th edition) becomes *Abies americana*, species No. 6.

Nos. 4 and 6 are described as follows:

4. ABIES (*Canadensis*) foliis linearibus obtusiusculis submembranaceis. *The Newfoundland White Spruce Fir.*

*Abies* foliis piceae brevioribus, conis parvis biuncialibus laxis. Rand.

6. ABIES (*Americana*) foliis linearibus obtusiusculis bifariam versis conis subrotundis. *The Hemlock Spruce Fir.*

A careful comparison of the descriptions of *Abies canadensis* Mill. and *Pinus canadensis* L. shows them to be identical in everything except the Gronovian synonym which Miller has removed from the Linnaean species and described and named as *Abies americana*. Under the Vienna Code, Articles 46 and 47 govern; the latter provides that in segregating a species, the specific name is retained for the element first published; and the former provides that where two or more groups are of the same date the author chooses and his choice cannot subsequently be modified. The conclusions we have arrived at from the above study are:

(1) Linnaeus published *Pinus balsamea* in 1753 and made it broad enough to include all east North American Abietae with single leaves.

(2) Miller, in 1759, segregated the Linnaean aggregate, recognizing four species.

(3) Linnaeus, in 1763, retained *Pinus balsamea* and described *Pinus canadensis* (dividing the hemlock spruce and placing a part



under each so that it can not be considered typical of either), thus recognizing only two of Miller's four species from America.

(4) Miller, in 1768, reestablished his four species, and gave them specific appellations under the binomial system as follows: the balsam fir or balm of Gilead fir became *Abies balsamea*; the white spruce, *Abies canadensis*; the black spruce, *Abies mariana*; and the hemlock spruce, *Abies americana*.

Under Articles 46, 47, 48, 50, and 51 of the Vienna Rules this choice of specific names by Miller for these plants can not be modified and the proper names and leading synonyms of the species are as follows:

ABIES BALSAMEA (L.) Mill. Gard. Dict. Ed. 8, No. 3. 1768.

*Abies taxifoliis*, odora, Balsami Gileadensis, Raii Hist. App.

Mill. Gard. Dict. Ed. 7, No. 6. 1759.

*Pinus balsamea* L. Sp. Pl. Ed. 1, 1002. 1753; Ed. 2, 1421. 1763 (as to name only).

*Picea balsamea* Loudon, Arb. Brit. 4: 2339. f. 2240-2242. 1844.

PICEA CANADENSIS (L.) BSP. Prel. Cat. N.Y. 71. 1888.

*Abies piceae* foliis brevioribus, conis parvis biuncialibus laxis.

Rand. Mill. Gard. Dict. Ed. 7, No. 5. 1759; Figures, pl. 1. 1760.

*Pinus canadensis* L. Sp. Pl. Ed. 2, 1421. 1763 (as to synonym of Miller).

*Abies canadensis* Mill. Gard. Dict. Ed. 8, No. 4. 1768.

*Pinus alba* Ait. Hort. Kew. 3: 371. 1789.

*Abies alba* Michx. Flor. Bor. Amer. 2: 207. 1803 (not of Miller, 1768).

*Picea alba* Link, Linnaea 15: 519. 1841.

PICEA MARIANA (Mill.) BSP. Prel. Cat. N.Y. 71. 1888.

*Abies piceae* foliis brevibus, conis minimis. Rand. Mill. Gard. Dict. Ed. 7, No. 4. 1759.

*Abies mariana* Mill. Gard. Dict. Ed. 8, No. 5. 1768.

*Pinus mariana* Du Roi, Obs. Bot. 38. 1771.

*Pinus nigra* Ait. Hort. Kew. 3: 370. 1789.

*Abies nigra* Du Roi, Handb. Baumg. 2: 182. 1800.

*Picea nigra* Link, Linnaea 15: 520. 1841.

***Tsuga americana*** (Mill.) nov. comb.

*Pinus balsamea* L. Sp. Pl. Ed. 1, 1002. 1753; Ed. 2, 1421.  
1763 (as to synonyms).

*Abies minor*, pectinatis foliis, Virginiana, conis parvis subrotundis, Pluk. Alm. Mill. Gard. Dict. Ed. 7, No. 3. 1759.

*Pinus canadensis* L. Sp. Pl. Ed. 2, 1421. 1763 (as to synonym of Gronovius).

*Abies americana* Mill. Gard. Dict. Ed. 8, No. 6. 1768.

*Pinus americana* Du Roi, Obs. Bot. 39. 1771.

*Abies canadensis* Michx. Fl. Bor. Am. 2: 206. 1803 (not of Miller, 1768).

*Picea canadensis* Link, Linnaea 15: 524. 1841.

*Tsuga canadensis* Carr. Trait. Conif. 189. 1855.

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